Adolescent and Parent Motivation for Change Affects Psychotherapy Outcomes Among Youth With Poorly Controlled Diabetes

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Objectives Investigate effect of baseline motivation for change on treatment fidelity, therapeutic alliance, treatment dose, and treatment outcome in a randomized controlled trial of family therapy for youth with poorly controlled diabetes.

Methods Seventy-four adolescents and caregivers completed measures of motivation for change. Measures of fidelity, alliance, dose, and youth health status were collected. Structural equation modeling was used to test the direct and indirect effects of motivation on treatment outcomes.

Results Parent motivation was significantly related to alliance and fidelity. Only alliance was significantly related to posttreatment metabolic control. In adolescent models, only motivation was significantly related to alliance. In both models, motivation had a significant indirect effect on metabolic control through alliance.

Conclusions Findings demonstrate the importance of parent and youth initial motivational status and treatment alliance to treatment outcome among youth with poorly controlled diabetes. Additional research on treatment techniques that promote motivation for change is needed.

Key words adolescents; diabetes; motivation for change; treatment outcome.

Introduction

Self-determination theory (SDT; Ryan & Deci, 2000) focuses on the development of intrinsic motivation, that is, engaging in an activity or behavior as a result of personal interest in or satisfaction with the activity/behavior rather than due to external pressure. SDT also proposes that while some behaviors will never be truly intrinsically motivated, as they may or may not be pleasurable, a person may still internalize these behaviors by identifying with the importance of the behavior and transforming external demands into personal values or goals (Williams, 2002). Motivation has been subsequently identified as a critical predictor of engagement in healthy behavior. In studies of adolescents, motivation has been shown to be related to a variety of health behaviors, such as the likelihood of substance use (Naar-King, Kolmodin, Parsons, Murphy, & ATN 004 Protocol Team, 2010), or engaging in exercise (Gillison, Standage, & Skevington, 2006), healthy eating (Backman, Haddad, Lee, Johnston, & Hodgkin, 2002), and medication adherence (Palardy, Greening, Ott, Holderby, & Atchison, 1998).

Motivation for behavior change has also been reported to affect treatment outcomes in adolescent psychotherapy trials. In a randomized controlled trial of substance abuse treatment, King, Chung, and Maisto (2009) reported that adolescent readiness to change marijuana use at baseline predicted subsequent reductions in marijuana use at treatment termination. In a large sample, multicenter trial of cognitive behavior therapy for adolescents with depression, Lewis et al. (2009) showed that both readiness to change at baseline and increases in readiness to change during the course of treatment were related to reductions in depression at the end of treatment. These findings parallel a significant body of adult psychotherapy
research suggesting that client motivation for behavior change at treatment entry, as well as indicators of high motivation during treatment, predict more symptom reduction at the end of treatment (Hogue, Dauber, & Morgenstern, 2010; Moyers et al., 2007).

Despite the growing evidence for the importance of adolescent motivation for health behavior in general, and behavior change during treatment in particular, there are very few studies investigating how adolescent motivation, or that of their caregivers, might affect the course of psychotherapy. While motivation for behavior change might have a direct effect on health outcomes, it could also have an indirect effect on health outcomes through other important variables such as quality of treatment implementation (treatment fidelity) or therapeutic alliance (Hogue, Liddle, Singer, & Leckrone, 2005). SDT has also been used to understand the relationship between client motivation and therapeutic alliance (for example, the development of shared treatment goals) and how this, in turn, affects treatment engagement and treatment outcomes (Ryan & Deci, 2008).

Treatment alliance is one of the most extensively investigated predictors of treatment outcome in the psychotherapy literature. A recent meta-analysis of child psychotherapy trials showed an effect size of .22 of treatment alliance on treatment outcome independent of youth age, or mode of treatment (Shirk & Karver, 2003). In addition, a small but growing number of studies on child treatment (Ellis, Naar-King, Templin, Frey, & Cunningham, 2007; Hogue et al., 2005; Huey, Henggeler, Brondino & Pickrel, 2000) have demonstrated that the degree to which therapists implement an empirically supported adolescent treatment with high fidelity affects treatment outcomes. For example, in a treatment trial targeting improved regimen adherence in youth with poorly controlled diabetes, Ellis, Naar-King et al., (2007) showed that higher fidelity to the treatment model was predictive of more improvements in youth illness management and blood glucose levels. Client motivation may affect treatment fidelity in that clients with low motivation may fail to complete homework, frequently miss sessions requiring intervention content to be presented multiple times or may have high levels of resistance to implementing therapist recommendations, all of which could affect therapists’ ability to use intervention materials as they were designed to be delivered.

Studies of the effects of adolescent and parent motivation for change on treatment alliance and therapist fidelity have the potential to identify conditions under which treatment may be more or less effective and also to inform the improvement of behavioral treatment technologies for this age group. For example, if client motivation affects treatment alliance, therapists might tailor interventions for adolescents with low motivation to focus more on interpersonal interactions and motivation building during early treatment sessions. Similarly, specialized interventions to engage parents with low motivation to change may be necessary for family-based treatments to succeed. If adolescent or parent motivation affects the therapist’s ability to deliver family treatments with high fidelity, therapists or supervisors might also need to closely monitor the quality of their treatment implementation when motivation is low.

Finally, motivation for change might affect treatment outcomes through its effects on dose of treatment received by clients. For example, MacDonell, Ellis, Naar-King, & Cunningham (2010) showed that adolescents with higher baseline readiness for weight loss attended more weight loss treatment sessions; in turn, adolescents who attended the most sessions lost significantly more weight than low session attendees. In a randomized clinical trial, Nock & Kazdin (2005) demonstrated that parents of children with oppositional behavior who received a motivational intervention in addition to parent training attended more treatment sessions than those who received parent training alone.

The purpose of the present study was to investigate the effects of adolescent motivation for change at treatment entry on (a) therapist treatment fidelity and therapeutic alliance and (b) treatment dose and treatment outcomes (diabetes-related health status) in a randomized controlled trial of intensive, home-based family therapy. The trial tested the effects of multisystemic therapy (MST) (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009) to improve regimen adherence among youth with insulin-dependent diabetes and chronically poorly controlled diabetes. In particular, we hypothesized that adolescent motivation to improve illness management behavior would have a significant direct effect on treatment outcomes as well as a significant indirect effect through its effect on treatment fidelity, therapeutic alliance, and dose of treatment received. A secondary purpose of the study was to evaluate the effects of parental motivation for changing parenting behavior on youth treatment outcomes, as MST is a family therapy approach and changing parents’ interactions with their adolescent around diabetes management was a significant component of treatment.

Methods

Participants
Youth and their primary caregivers were participants in a clinical trial investigating the effectiveness of MST for
improving diabetes self-management in youth with diabetes in chronically poorly metabolic control. In order to be eligible, participants had to be between 10 and 17 years of age, have a diagnosis of type 1 or type 2 diabetes for at least one year that required management with insulin, have a current HbA1c of 8% or higher and a mean HbA1c of 8% or higher during the year before study entry, and be residing in a home setting (e.g., not in residential treatment). No child psychiatric diagnoses were exclusionary with the exception of moderate or severe mental retardation, and psychosis. Families were also excluded if they were not English speaking or could not complete study measures in English. 71% of eligible families agreed to participate.

The average age of parents and adolescents participating in the present study was 40.4 years (SD = 7.0) and 14.2 years (SD = 2.2), respectively (Table 1). 92% of the parents and 57% of the youths were female. Eighty-one percent of adolescents were African American, 19% were White, and the rest were of other race/ethnicity. 58% of the parents described themselves as single parents. Overall, the demographics of the sample were representative of youth with poorly controlled diabetes. Mean duration of diabetes for youth was 4.6 years (SD = 3.0) and mean HbA1c was 11.4% (SD = 2.2%). Most youth (85%) had type 1 diabetes and the remainder had type 2. There were no significant differences between youth with types 1 and 2 diabetes on adolescent age at study entry [t(70) = −.96, NS, ES = .32], number of parents in the home [χ²(1, N = 72) = .52, NS, ES = .03] HbA1c at study entry [t(70) = −1.35, NS, ES = .41] or number of treatment sessions [t(70) = −1.22, NS, ES = .45] and all effect sizes were small.

Procedure
Potential participants were initially approached in person by medical staff at the time of a regularly scheduled visit to a university-affiliated pediatric diabetes clinic or during an inpatient hospitalization. This was followed up by contacts from study research staff and home-based consent visits if families indicated an interest in participating. The research was approved by the Human Investigation Committee of the university affiliated with the hospital where the adolescents were seen for medical care. All participants provided informed consent and assent to participate.

The design of the parent study from which data for the present study were drawn was a randomized controlled trial of MST. Youth randomized to MST received approximately 6 months of intensive, home and community-based treatment care while youth randomized to the control condition received weekly supportive telephone calls. Youth in both conditions received standard medical care. Posttest data collection took place seven months after baseline data collection (i.e., treatment completion). All measures were collected by a trained research assistant in the participants’ homes. Both the youth and the primary caregiver completed questionnaires. Families were provided $50 to compensate them for participating in each data collection session.

Adolescents assigned to the intervention condition received MST. MST is an evidence-based, intensive, family-centered, community-based treatment originally designed for use with adolescents presenting with serious antisocial behavior (Henggeler et al., 2009). Our group has extensively adapted MST to the treatment of poor self-management in youth with chronic illnesses including diabetes (Ellis, Templin et al., 2007), HIV infection (Ellis et al., 2006), and asthma (Naar-King, Ellis, Kolmodin, Cunningham, & Secord, 2009). MST includes several key features: (a) a comprehensive set of identified risk factors (e.g., across individual, family, peer, school, and neighborhood domains) associated with the problem behavior is targeted through interventions that are individualized for each adolescent; (b) these interventions integrate empirically based clinical treatments (e.g., cognitive–behavioral therapy), which historically have been used to focus on a limited aspect of the adolescent’s social ecology (typically only the individual adolescent or at most the adolescent and family), into a broad-based ecological framework that addresses relevant risk factors across family, school, and community contexts; (c) interventions focus on promoting behavioral changes in the adolescent’s natural ecology by empowering caregivers with skills and resources to address difficulties inherent in raising adolescents and empowering adolescents to cope with family, school, and neighborhood problems; (d) services are delivered via a home-based model, which facilitates high engagement and low dropout rate and are delivered in home, school, and/or neighborhood settings at times convenient to the family; and (e) MST programs include an intensive quality assurance system that aims to optimize youth outcomes by supporting therapist fidelity to MST treatment protocols (Henggeler et al., 2006).

MST treatment was provided by five masters-level therapists with varied backgrounds (three psychologists, two social workers). Three therapists were African-American and two were White. In order to promote fidelity to the MST model, state-of-the-art quality assurance protocols were used that included an initial five-day training, weekly on-site clinical supervision from a PhD-level supervisor with an extensive background with MST and its application to treatment of chronically ill children.
weekly phone consultation with an MST expert with experience with the application of MST to diabetes, and quarterly booster training. The initial five-day training was adapted by the research team to include formal diabetes education for therapists as well as education regarding factors that are predictive of poor treatment adherence and metabolic control among adolescents with diabetes. Therapists were trained to have sufficient knowledge regarding diabetes to enable them to conduct diabetes adherence interventions with families (e.g., reinforce how to count carbohydrates).

Quality assurance protocols also included feedback on therapist and supervisor fidelity to MST procedures (Henggeler & Schoenwald, 1998; Schoenwald, 1998). Since MST therapists draw upon a menu of evidence-based interventions, MST treatment fidelity assessments focus upon treatment integrity (whether therapists engaged in actions consistent with the treatment model) as opposed to treatment differentiation (whether therapists engaged in actions consistent with another treatment model) (Moncher & Prinz, 1991).

Therapists began by conducting a multisystemic assessment of the strengths and weaknesses of the family, then based upon this assessment tailored treatment goals and interventions to each family to best treat the adherence problem.

MST interventions targeted adherence-related problems within the family system, peer network, and the broader community systems within which the family was embedded (Ellis, Templin et al., 2007). Therapists drew upon a menu of evidence-based intervention techniques that included cognitive–behavioral therapy, parent training, and behavioral family systems therapy.

In the present study, therapists were expected to meet with families and their related contacts (e.g., extended family, physicians, and school personnel) a minimum of two to three times per week at the beginning of treatment with an option for reduced number of sessions at the end of treatment. Treatment was terminated when treatment goals were met rather than when a set number of sessions were completed. However, based on previous MST trials and our own prior experience, treatment was planned to last for approximately 6 months. Mean length of treatment was 5.3 months ($SD = 1.7$) and mean number of sessions was 44 ($SD = 20$).

The initial subject pool for the present study consisted of the 74 families who were randomized to the MST arm of the larger study. Families randomized to the telephone support arm were not included because formal measures of treatment fidelity were not available for this intervention and because parents did not participate in treatment. Of the 74 families, 2 received no treatment sessions at all. Since these families never met with their therapist, they could not complete ratings of treatment alliance or treatment fidelity, nor could the therapist complete ratings of treatment fidelity; their data were not included in the present study. The final sample consisted of 72 adolescents and their families.

**Measures**

**Motivation to Change**

Parent and adolescent motivation to change at study entry was measured by an adapted version of Rollnick’s Readiness Ruler (Stott, Rollnick, & Pill, 1995). Since motivation to change is behavior-specific, the items were tailored to the behaviors most critical to diabetes care. For instance, parents were asked how ready they were to make changes in their parenting related to their child’s diabetes, like increasing supervision of diabetes care or increasing support by buying different groceries. Adolescents were asked how ready they were to make changes in testing their blood glucose, taking prescribed doses of insulin and dietary habits. Parents and youth marked their motivation to change on a scale from 1 (not ready to change) to 10 (already trying to change). Items were summed across the different behaviors to obtain a total motivation for change score (four items for the youth version, six items for the parent version). Higher values indicated higher motivation to change the behavior. Cronbach’s $\alpha$ in the present study was .94 for the parent version and .71 for the adolescent version.

**Treatment Alliance**

The Barriers to Treatment Participation Scale (BTPS) (Kazdin, Holland, Crowley, & Breton, 1997) is a 44 item parent-completed instrument designed to assess factors that interfere with participation in child and family psychotherapy. The BTPS has been shown to predict length of treatment and canceled appointments as well as treatment outcomes (Kazdin & Wassell, 2000). It is comprised of four subscales: stressors and pragmatic obstacles, treatment demands and issues, perceived relevance of treatment, and relationship with therapist (i.e., working alliance). For the purpose of the present study, the relationship with therapist subscale was used to evaluate alliance; other subscales were not used. Lower scores indicate that the parent perceived higher treatment alliance between themselves and the therapist. The BTPS was administered at the completion of MST treatment. Cronbach’s $\alpha$ for the scale in the present sample was .89.
Treatment Fidelity
Questionnaire ratings of fidelity were obtained via the 15-item Adherence subscale (Schoenwald, Sheidow, Letourneau, & Liao, 2003) of the therapist adherence measure (TAM) (Henggeler & Borduin, 1992). The TAM was designed to assess fidelity to the MST model from the perspective of the therapist and the adolescent’s caregiver who was participating in treatment. Caregivers and therapists independently completed the TAM. Items were rated using a 5-point Likert scale from 1 (“not at all”) to 5 (“very much”). Example of items from the adherence subscale of the TAM included “I/The therapist tried to change some ways that family members interact with each other” and “I/The therapist recommended that family members do specific things to solve their/our problems.” Cronbach’s α coefficients for the present sample were .85 for the therapist version (TAM-T) and .93 for the caregiver version (TAM-C). Caregivers and therapists completed the TAM once per month during treatment. All completed TAMs were then aggregated and a mean adherence (treatment fidelity) score was calculated across all TAM-Ts and TAM-Cs for each family. Higher TAM scores indicated higher fidelity.

Treatment Dose
Dose of treatment was evaluated by the total number of treatment sessions held with the family. Number of sessions and another potential measure of treatment dose, duration of treatment, were highly correlated with each other (r = .73). Therefore, the number of sessions was chosen as it appeared to best reflect potential dose variability related to the lack of a specified number of treatment sessions per week in the MST treatment model.

Health Status
Metabolic control was calculated using hemoglobin A1c (HbA1c), a retrospective measure of average blood glucose during the past two to three months. Values were obtained using the Accubase A1c test kit, which is FDA approved. The test uses a capillary tube blood collection method instead of venipuncture and is therefore suitable for home-based data collection. High-performance liquid chromatography (HPLC) is used to analyze the blood sample.

Results
Bivariate analyses were conducted to assess simple relationships between variables. The hypotheses that family motivation would have an indirect effect on treatment outcome (HbA1c) through its effects on treatment alliance, treatment fidelity and treatment dose were tested via structural equation modeling (SEM) using Amos Version 18.0. Since some adult psychotherapy research has shown that alliance predicts treatment dose, fidelity and alliance were allowed to predict treatment dose as well as HbA1c. Since most constructs were measured with a single instrument, models were evaluated using path analysis, a form of SEM that uses all single indicator constructs. Path analysis is similar to ordinary least-squares regression but retains the advantage of allowing both the assessment of goodness of fit of a specified model and testing of each estimated path coefficient. Separate models were estimated for the effects of caregiver and youth motivation.

Bivariate Analyses
Adolescents and parents in the study both reported a relatively high level of motivation for change at study entry, with parents reporting a mean score of 7.80 and adolescents reporting a mean level of 7.51 on the Readiness Ruler (Table 2). As shown in Table 2, adolescent motivation to change was not significantly related to therapist-rated treatment fidelity (r = .06, NS) but was significantly related to parent-rated treatment alliance (r = -.39, p < .001) such that higher baseline adolescent motivation was related to higher parental ratings of treatment alliance at the end of treatment. Adolescent
motivation to change was not significantly related to either treatment dose ($r = .08$, NS) or HbA1c at treatment termination ($r = -.09$, NS). Parent motivation to change was significantly related to therapist-rated treatment fidelity ($r = .28$, $p < .05$): higher baseline motivation for change parenting behaviors was related to higher therapist ratings of treatment fidelity over the course of treatment. Parent motivation to change was also significantly related to treatment dose ($r = .31$, $p < .01$), with higher motivation to change parenting behaviors related to a higher number of treatment sessions. Parent motivation was not significantly related to HbA1c at treatment termination ($r = -.14$, NS). Therapist-rated treatment fidelity was significantly related to HbA1c at treatment termination ($r = -.25$, $p < .05$), as was parent-related treatment alliance ($r = .24$, $p < .05$) such that higher treatment fidelity and higher treatment alliance were related to better HbA1c at treatment termination. Parent ratings of treatment fidelity were not significantly related to any other variables used in the model testing and therefore were not included in the path analyses described below.

**Path Analyses**

Two structural equation models with all single indicator variables were fit to the variance/covariance matrix using a maximum likelihood solution to estimate relationships between variables. Each model had one exogenous variable (caregiver/youth motivation) and five endogenous variables (treatment alliance, treatment dose, treatment fidelity, baseline HbA1c, and follow-up HbA1c). Dose as well as treatment alliance and treatment fidelity were used as predictors of HbA1c. Baseline HbA1c was included in the model to control for the effects of adolescents’ initial health status. A full model was tested with motivation having both direct effects on HbA1c and indirect effects through dose alliance and fidelity. Three fit indices were evaluated: that the likelihood ratio $X^2$ test of model fit was nonsignificant, the comparative fit index (CFI) was $>.90$, and the root mean square error of approximation (RMSEA) was $<.08$.

Results of model testing for the parent and adolescent model are shown in Figure 1 with standardized path coefficients. Results for the model using parent motivation [$X^2 (5, N = 72) = 5.71, p = .34$ CFI $= .98$, RMSEA $= .05$] showed an excellent fit to the data. The results of a Bollen–Stine bootstrap analysis (Bollen & Stine, 1992) confirmed the model ($p = .273$). Parent motivation for change was significantly related to treatment alliance and treatment fidelity in the expected direction and related to treatment dose at the trend level. However, only treatment alliance was significantly related to HbA1c at treatment completion. Parent motivation did not have a significant direct effect on HbA1c. However, the indirect effect of motivation on HbA1c through treatment alliance was evaluated using the distribution of product approach (i.e., bootstrapping, 5000 samples with replacement; Preacher & Hayes, 2008). This analysis reveal an indirect effect of $-.012$ ($SE = .006$) that was significant at $p < .05$ using the 95% bias-corrected confidence interval. Overall, this model accounted for 31% of the variance in HbA1c. The adolescent model also demonstrated an acceptable fit to the data [$X^2 (5, N = 72) = 8.16, p = .15$, CFI $= .92$, RMSEA $= .09$] and was confirmed by a Bollen–Stine bootstrap analysis ($p = .100$). However, the adolescent model differed from the caregiver model in that adolescent motivation to change was significantly related only to treatment alliance. As in the parent model, adolescent motivation did not have a significant direct effect on HbA1c but had a significant indirect effect ($-.023$, $SE = .013$, $p < .05$ using 95% bias-corrected confidence

### Table II. Correlations Between Family Motivation, Treatment Process and Treatment Outcome Variables

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Mean (SD): 7.51 (2.10), 7.80 (2.23), 65.97 (5.41), 60.51 (5.03), 7.10 (1.67), 44.05 (19.95), 11.37 (2.21), 10.25 (2.16)

Note: RR-A, adolescent readiness ruler; RR-P, Parent readiness ruler; TAM-T Therapist adherence measure-Therapist version; TAM-C, Therapist adherence measure-caregiver (Parent) version; BTPS, Barriers to treatment participation Alliance Subscale; Dose, Number of treatment sessions; T1 HbA1c, baseline hemoglobin A1c; T2 HbA1c, 6 month follow-up hemoglobin A1c.

* $p < .05$, ** $p < .01$. 
Discussion

Recent advances in the study of motivation (Ryan & Deci, 2000) have highlighted the importance of motivational factors on engaging in and changing health behaviors. The purpose of the present study was to assess the effect of adolescent and parent motivation to change behaviors related to diabetes care at treatment entry on treatment outcome in a randomized clinical trial of MST, an intensive, home-based family treatment. The potential direct effects of adolescent and parent motivation to change on metabolic control at the end of treatment as well as the indirect effects of motivation on metabolic control through therapist treatment fidelity, treatment alliance, and dose of treatment were investigated.

Readiness to change was relatively high in the present sample of youth with chronically poorly controlled diabetes and their parents. High levels of motivation were of interest given that youth in poor control are often viewed as difficult to manage medically and as resistant to behavioral interventions given difficulties documented in engaging such families in either diabetes education or mental health services (Harris & Mertlich, 2003; Murphy, Rayman, & Skinner, 2006). Youth reported that they were ready to make changes in their daily diabetes care behaviors, such as taking all doses of insulin and testing their blood glucose four or more times per day, while parents reported that they were ready to engage in behaviors such as increasing their support to their child for diabetes care and increasing their supervision and oversight of diabetes care completion. High scores may have simply reflected sampling biases in light of the fact that unmotivated youth and caregivers may have likely declined to participate. However, study recruitment rates were fairly high (70%) suggesting that many adolescents and their parents were well aware that their diabetes care and/or parenting contributing to their high blood glucose levels and were willing to receive services to improve diabetes management when services could be provided in a way that overcame barriers to access (e.g., home-based services).

In multivariate models, neither parent nor youth baseline motivational status had a direct effect on metabolic control at the end of treatment. However, baseline parent motivation to change parenting behaviors related to diabetes care and youth motivation to change diabetes care behavior were both predictive of parental ratings of therapeutic alliance at the end of treatment. Therapeutic alliance, in turn, was predictive of posttreatment metabolic status with higher alliance predicting better youth HbA1c at treatment completion. Baseline motivation had a significant indirect effect on youth metabolic control in both cases. These data are unique in showing that initial youth motivation for health behavior change affects physiological health status in a treatment trial targeting chronically ill adolescents. Caregiver initial motivation to change parenting behavior was also shown to affect the youth’s

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**Figure 1.** Results of the structural equation models testing the relationship between caregiver/teen motivation, treatment alliance, treatment dose, treatment fidelity, and metabolic control. RR = readiness ruler (motivation), BTPS = barriers to treatment participation (alliance), TAM-T = treatment adherence measure-therapist version (fidelity), T2 HbA1c = 6 month follow-up metabolic control, T1 HbA1c = baseline metabolic control; *p < .10, **p < .05, ***p < .01, ****p < .001.
health status at treatment termination. Moreover, findings suggest that parent and youth motivational status did not directly affect treatment outcome but rather affected the formation of a strong treatment alliance, which in turn accounted for significant variance in metabolic control at the end of treatment. Consistent with the broader psychotherapy literature, treatment alliance was important predictor of treatment outcome even within a family based treatment technology using largely behavioral and cognitive–behavioral approaches. This suggests that therapists need to be aware of both parent and youth motivational status early in the course of treatment; increasing the use of motivation- and rapport building techniques for families with low readiness to change early in treatment may be one way to avoid adverse effects on treatment alliance (e.g. lack of shared treatment goals, lack of agreement on how to address problem behaviors) and hence poor treatment outcomes.

Multivariate models also showed that baseline parent motivation was significantly related to therapist ratings of treatment fidelity over the course of treatment and marginally related to treatment dose. Therefore, therapists were more likely to rate themselves as delivering the MST model with high integrity as well as to meet with families more often among families where parents were more motivated to change parenting behaviors. However, neither treatment dose nor treatment fidelity affected post-treatment metabolic control once strength of treatment alliance was accounted for. Dose may not have been related to HbA1c due to a variety of factors that may have led to restriction of range in the number of treatment sessions: (1) the data were drawn from a clinical trial that specified a maximum 6 month length of treatment even if improvements in diabetes care and/or metabolic control had not been made and (2) the nature of the MST treatment model specified that therapists exert significant efforts to locate and meet with families even when they engaged in behaviors that would have led to treatment termination in an outpatient setting, such as no-showing for sessions or not returning phone calls.

The lack of relationship between treatment fidelity and posttreatment metabolic control once strength of treatment alliance was accounted for was an unexpected finding, especially as a study from our previous clinical trial with youth with poorly controlled diabetes showed that higher treatment fidelity predicted more change in metabolic control (Ellis, Naar-King, Templin, Frey, & Cunningham, 2007). However, this suggests the possibility that therapist factors specific to relationship building with families were more important to youth outcome than quality of intervention delivery in the present study. Alternatively, as treatment fidelity was fairly high, as would be expected in a clinical trial with close oversight of therapist quality assurance, fidelity may have had less effect on treatment outcomes than alliance. Parent motivational status did have a marginal effect on treatment fidelity such that therapists reported poorer implementation of the MST treatment model when parents had low motivation to change parenting behavior. Increased input from supervisors to assist with managing difficult parents may be one way to ensure that treatment fidelity is not adversely impacted by client factors.

Findings from the present study are limited by a relatively small sample size and replication of the results is warranted. Furthermore, objective measures of treatment fidelity were not included in the present study and would be useful to better assess how family motivational status, treatment fidelity, and treatment alliance interact to affect treatment outcomes. Self-management was not directly assessed in the present study and therefore the improvement in HbA1c could be due in part to factors other than changes in diabetes management. As the study was a treatment trial of a behavioral intervention youth with chronically poor metabolic control, findings may not generalize to interventions for youth with diabetes that is better controlled.

In summary, the present study showed the importance of both parent and youth initial motivational status in predicting treatment outcomes in a treatment trial of home-based family therapy for youth with poorly controlled diabetes. Future attempts to improve behavioral treatment technology for difficult-to-manage youth with diabetes and their parents would be enhanced by better specification of those treatment techniques that promote motivation for behavior change in family therapy.

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